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## SLOT COVER OF A SHIFTING DEVICE

## Specification:

5 The present invention pertains to a slot cover of a shifting device of a motor vehicle transmission with a selector lever and a kinematics for transmitting the selection movements to a transmission, preferably an automatic transmission, with a movable louver, which covers at least one movement gate (shift gate, selection gate), and with a guide for the louver, wherein the louver has at least one opening for the passage of the selector lever.

10 A similar slot cover has already been known from DE 44 45 925 C1. This document discloses a slot cover of a shifting device for an automatic transmission of a motor vehicle with a selector lever, wherein the movable louver, which covers the shift gate, is guided by laterally arranged guide rails (U sections), and wherein the louver has an opening, through which the selector lever passes. The louver itself is rigid at right angles to its direction of movement and can be easily bent in the direction of movement.

15 This design is associated with the problem that the louver causes rattling or grating noises during movements in the guide or even during vibrations. Furthermore, the guiding of the louver is problematic concerning its durability and reliability of operation, because the ends of the louver are free and breakage or other damage to the louver may easily occur as a result.

The object of the present invention is to find a slot cover for a shifting device of a motor vehicle transmission which can be moved with low noise, on the one hand, and guarantees reliable guiding of the louver, on the other hand.

20 The object of the present invention is accomplished by the features of claim 1.

It is proposed according to the present invention that the prior-art slot cover of a shifting device of a motor vehicle

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5 transmission, which has a selector lever and a kinematics for transmitting the selection movements to a transmission and which has a movable louver, which covers at least one movement gate (shift gate, selection gate) of the shifting device and has a guide for the louver, where there is at least one opening in the louver for the passage of the selector lever, be improved such that the louver is designed as an endless band, which forms a closed loop.

10 Due to this embodiment of the louver as an endless band, the guiding of the louver is improved, because not only forces acting in one direction, but also both pulling and compressive forces will now act on the louver during the forward or backward movement of the selector lever at the same time. Furthermore, it becomes possible due to this embodiment to make the louver especially supple, because the guiding of the louver is substantially improved due to the bypassing of the force, and the intrinsic rigidity of the louver, which was necessary in the state of the art, is no longer necessary. Since soft materials do not tend to rattle, the louver according to the present invention also has low noise.

15 According to a special embodiment of the slot cover, provisions are made for the guide of the louver to have at least one deflecting element, wherein a deflecting element may optionally consist of one or more deflecting rollers, which rotate around a deflection axis. In addition, the deflecting element, of which there is at least one, may also have curved sliding surfaces for the louver, around which the deflecting takes place.

20 A plurality of deflecting elements, preferably four deflection axes, are provided for guiding the louver in a preferred embodiment of the slot cover. It is especially advantageous for at least two deflection axes to be arranged within the loop formed by the louver, wherein it is additionally advantageous for at least one deflection axis and preferably two deflection axes to be located outside the louver loop. Due to the arrangement of two deflection axes within the louver loop, the louver can be stretched in the corresponding manner, while the deflecting element, of which there is at least one, which is located outside the louver loop, can ensure a corresponding tension of the louver.

25 A deflection axis may comprise, on the one hand, an individual, transversely extending deflecting roller or two laterally arranged, short deflecting rollers, which may in turn extend coaxially.

In another advantageous embodiment of the slot cover, at least one of the deflecting elements is mounted

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elastically. Due to the mounting, the louver loop is able to provide an internal tension, which makes possible an especially problem-free and reliable guiding of the louver. On the other hand, it is also possible to make the louver itself elastic, at least over part of its loop, so that the preferred tension that shall load the louver will be brought about by the elasticity of the louver itself. However, it is not absolutely necessary to make the entire louver elastic in this case, but it is sufficient for part of the loop to be elastic. These may be preferably narrow loops of the louver.

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It may also be advantageous in this connection for the louver to have a multipart design. For example, it is possible to design the covering part proper of the louver as a lamella-type covering part, while the connection parts between the part of the louver that is designed as a lamella-type part [no other component is mentioned to justify "between" - Tr.Ed.] have at least one elastic element, e.g., a spring or an elastic band.

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Another advantageous embodiment provides preferably laterally arranged slide rails for guiding the louver, which said rails are laterally engaged by the louver. An especially reliable guiding is guaranteed by this embodiment.

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Other advantageous embodiments of the louver provide for the louver being made as a louver consisting of a rubber or plastic band, as a wire loop or as a louver consisting of other materials, in which case it is also possible to design the louver - at least partially - as a series of lamellae placed transversely located next to one another.

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According to an embodiment of the slot cover according to the present invention, provisions may be made for the slot cover being guided completely above the shifting device proper. As a result, it is possible to provide two openings in the louver, with one of the openings surrounding the selector lever in a relatively accurately fitting manner, while the other opening has a sufficient clearance, so that movements of the selector lever, which lead to an opposite movement of the louver loop on the lower side of the louver, are made possible.

Moreover, a means for detecting the shift position of the selector lever may be additionally integrated in a slot cover according to the present invention in a simple manner. For example, signal transmitters, whose signals are detected by signal receivers arranged at spaced locations, may be arranged at the deflecting elements. The principle, which functions similarly to the tachometer, may be embodied, e.g., by means of Hall sensors and permanent magnets, wherein a pair of measured values is assigned to each shift position.

It is evident that the features of the present invention that were mentioned above and will be explained below may be used not only in the particular combination indicated, but in other combinations or alone as well without going beyond the scope of the present invention.

Other features and advantages of the present invention appear from the subclaims and the following description of a preferred exemplary embodiment with reference to the drawings.

The figures show specifically:

- Figure 1 shows the bottom view of a slot cover with four deflection axes;
- Figure 2 shows the side view of the slot cover;
- Figure 3 shows an oblique 3D bottom view of the slot cover;
- Figure 4 shows a longitudinal section of the slot cover with cover plate;
- Figure 5 shows the front view of the slot cover with cover plate;
- Figure 6 shows the slot cover including the lateral offset; and
- Figure 7 shows the slot cover with the cover plate and the possibility of lateral offset.

Figures 1, 2 and 3 show different views of the slot cover according to the present invention.

Figure 1 shows a bottom view of the slot cover. The slot cover comprises a support structure 5, which comprises a central plate 5.3 arranged in the middle and two supports 5.1 and 5.2 arranged to the side of it. A generous opening 5.4 is provided in the central plate 5.3. Two deflecting elements, which are formed by two broad deflecting rollers 3.1 and 3.2, at the ends of which two gears 3.3 and 3.4 as well as 3.5 and 3.6 are arranged, are arranged at the outer ends of the support structure 5. The broad deflecting rollers 3.1 and 3.2 are mounted rotatably at the ends of the respective lateral supports 5.1 and 5.2. Furthermore, four narrow deflecting rollers 4.1 through 4.4, which form a rectangle with one another with two deflection axes, are located in the central area of the supports 5.1 and 5.2. The narrow deflecting rollers 4.1 through 4.4 are also mounted rotatably in the lateral supports 5.1 and 5.2. The louver 2, which forms an endless band, is guided around the deflecting rollers, and part of this endless band consists of a broad band 2.1 and the other part of two narrow bands 2.2 and 2.3, respectively, which pass over with their ends into the ends of the broad band. An opening is provided for the selector lever in the area of the broad band 2.1, and the two narrow bands 2.2 and 2.3 themselves form an opening through which a

selector lever can be passed.

5 The guiding of the band can be recognized especially clearly from Figure 2, which shows a side view of the slot cover. The band is guided such that the louver 2 surrounds the two broad deflecting rollers 3.1 and 3.2 on the end side and rolls on the gears 3.3 through 3.6 arranged on the broad deflecting rollers. The narrow deflecting rollers 4.1 through 4.4 are arranged outside the circumference of the band, and the small deflecting rollers 4.1 through 4.4 are pressed into the loop of the louver 2 and thus ensure a corresponding tension of the louver. On their edges, the deflecting rollers 4.1 through 4.4 have beads, which prevent the narrow bands 2.2 and 2.3 from breaking out. The division of the louver 2 in the area of the broad band 2.1 and in the area of the narrow bands 2.2 and 2.3 is designed such that the narrow deflecting rollers 4.1 through 4.4 come into contact only with the narrow bands 2.2 and 2.3 during a movement of the selector lever.

10 An additional guiding of the louver 2 is achieved by means of the lateral supports 5.1 and 5.2, which are curved on their top side and form a curvature, over which the louver 2 can slide. In addition, part of the central plate 5.3 is adapted to the curvature of the lateral supports 5.1 and 5.2, so that an improvement of the guiding of the louver is also achieved.

15 Figure 3 shows an oblique 3D bottom view of the slot cover according to the present invention, which once again illustrates the guiding of the louver and the function of the individual deflecting rollers.

20 The louver is very simple in terms of production technology in this preferred example, because, due to the entire design of the slot cover, it is possible to use a very thin and flexible endless rubber band, in which part of the rubber band is cut out on the inside, so that only the two narrow side bands 2.2 and 2.3 are left. In addition, the endless rubber band may be cut out of a long tube.

Figures 4 and 5 additionally show a longitudinal section and a front view of the slot cover according to the present invention with a cover plate 6, in which the shift and selection gates 7 for the selector lever are located.

25 If the slot cover according to the present invention is to be used for a shifting device with shift gates that have a lateral deflection, the opening for the selector lever in the louver 2 may be made in the area of the broad band 2.1 in the known manner such that either a sufficiently broad slot is inserted for the selector lever, or an additional,

transversely movable louver is integrated within the louver or is placed over the broad slot, so that complete coverage of the slot is always ensured.

Another possibility of covering the lateral mobility of the selector lever, in which case only a fitting hole is provided for the selector lever in the broad band, can be obtained by arranging the entire slot cover 1 laterally displaceably in relation to the cover plate 6, so that the entire slot cover 1 likewise moves to the side during a sideways movement of the selector lever.

Figures 6 and 7 show such a slot cover 1, which can be displaced as a whole in relation to the cover plate 6 by a sideways movement of the selector lever.

Figure 6 shows the slot cover 1 with a selector lever 8, which is passed through an opening 2.4 through the louver 2. A lateral position of the selector lever 8, by which the entire slot cover 1 including the support structure 5 is also displaced to the side, is indicated by broken line.

Figure 7 shows a bottom view of a cover plate 6, under which the slot cover 1 according to the present invention is arranged. The selector lever 8 - fixed in a sideways pivoted position - is indicated by broken line here as well, in which case the slot cover 1 has also been displaced in relation to the cover plate 6. The displaceability of the slot cover 1 in relation to the cover plate 6 may be achieved, e.g., by the support structure itself being fastened on the shifting device or on the slot cover with a bracket, which allows a lateral movement of the slot cover. It would be possible, e.g., to clip the slot cover with the axes of the broad deflecting rollers 3.1 and 3.2 in a clamp on the narrow sides, where the said clamps are substantially narrower in their broad extension than the length of the broad deflecting rollers, so that the entire slot cover 1 can be moved on it from right to left.

On the whole, it is consequently achieved with the slot cover according to the present invention of a shifting device of a motor vehicle transmission that reliable guiding of the louver is brought about and the louver is movable in the guide with low noise.

According to another aspect of the present invention, it is now also possible to make do without a second louver for covering the lateral mobility with a very simple design of the slot cover in shifting devices that are equipped with laterally movable selector levers, because the entire cover can now move laterally in itself.

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**List of Reference Numbers:**

- 1 Slot cover
- 2 Louver
- 2.1 Broad band
- 2.2, 2.3 Narrow band
- 2.4 Opening
- 3.1, 3.2 Broad deflecting rollers
- 3.3-3.6 Gear
- 4.1-4.4 Narrow deflecting rollers
- 5 Support structure
- 5.1, 5.2 Lateral support
- 5.3 Central plate
- 5.4 Opening in the central plate
- 6 Cover plate
- 7 Shift gate
- 8 Selector lever